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E82-10298  
CR-168867

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DELINEATION OF SOIL TEMPERATURE  
REGIMES FROM HCM DATA

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March 31, 1982  
Quarterly Report

(E82-10298) DELINEATION OF SOIL TEMPERATURE  
REGIMES FROM HCM DATA Quarterly Report  
(Pennsylvania State Univ.) 3 p  
HC A02/MF A01

CSCI 08M

N82-24574

Unclas  
G3/43 00298

Prepared for  
Goddard Space Flight Center  
Greenbelt, Maryland 20771

**RECEIVED**

APR 8, 1982

SIS/902.6

HFO-012

Type II

A. Objectives of Contract

An investigation is proposed in which remotely sensed data from the HCMM and Landsat satellites will be evaluated as input into the National Cooperative Soil Survey. The objectives of the project are to:

- 1) determine the feasibility of using HCMM and ancillary data to measure soil surface and plant canopy temperatures and to thereby delineate and map soils into their respective soil temperature regimes; and
- 2) develop and evaluate techniques for using HCMM and HCMM-Landsat merged data for input to the National Cooperative Soil Survey.

B. Activities During Reporting Period

- 1) Subsetting of HCMM data into ORSER format has been completed for four dates using a modified SUBSET program. Large areas (approximately 2500 scan lines, 1680 elements) were selected to increase the occurrence of suitable control points for registration.
- 2) Average daily temperatures (ADT) were calculated for each date. MERGE program combined registered daytime temperature (DAY-IR) with nighttime temperature (NIGHT-IR) to form a separate two-channel data set. SUBTRAN program averaged the DAY-IR and NIGHT-IR creating a third ADT channel.
- 3) Registration equations for the four ADT data sets were generated. Enlarged (4X) uniform contrast stretched electrostatic plots from the Versatec plotter were generated for the daytime visible (DAY-VIS) using NMAPV program. Numerous control points were selected and digitized. Linear regression models provided good accuracy of within one pixel (RMS). WARP program plotted the spatial distortion of each data set during registration.
- 4) A one-dimensional soil heat flow equation has been modified to allow for mean annual soil temperature (MAST) predictions using merged ADT data sets. Linearization of the equation provides for confidence estimates of MAST predictions.
- 5) Additional ancillary ground truth data have been collected, such as soil survey field sheets and Nevada MAST prediction equations.

C. Planned Activity

- 1) Complete MAST prediction and display process; create a multi-channel ADT data set with MERGE program and subset a suitable site for analysis using SUBSET program; and apply the prediction equation and display MAST predictions on the Versatec plotter.
- 2) Compare MAST predictions with ground truth data and analyze statistical confidence of predictions. Evaluate classification results during field surveys planned for May/June 1982.

- 3) Overlay Digital Terrain Elevation data with HCMM DAY-IR and NIGHT-IR data sets and evaluate their relationship.
- 4) Complete Landsat classification and registration with HCMM data. Measure the effects of HCMM in discriminating between selected surface categories.
- 5) Generate photographic color composite display products from Versatec plots of three Landsat channels or three HCMM dates.

D. Potential Problem Areas

- 1) Data processing of HCMM data tapes has been slowed due to processing errors on raw HCMM data tapes. Errors visible on hard-copy imagery were not corrected.
- 2) HCMM scene selection has been limited by cloud and snow cover to five suitable dates. Additional data would improve predictions.
- 3) The accuracy of Landsat and HCMM registration may be a predominant factor in determining the size and types of categories which can be used to measure the effects of HCMM on category discrimination.

E. Costs Accrued to Date

Katherine Marinakos (Secretary), Nanna Bolling (Image Analyst), and George Baumer (Systems Analyst) are presently funded on this project. Rick Day (Graduate Assistant) has been supported by departmental teaching funds.